

EXPRESS MAIL NO. EL 920 880 334 US

DATE OF MAILING 12/14/01

Our Case No. 9281-4258
Client Reference No. N US00121

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Kiyoshi Sato et al.)
Serial No. To Be Assigned)
Filing Date: Herewith)
For: Thin-Film Magnetic Head With)
Narrowed Track Width and Method for)
Making Same)

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Prior to examination of the above-identified application, please amend the application as follows:

In the Claims

Please rewrite Claim 1 as follows:

1. (Amended) A thin-film magnetic head comprising:
 - a lower core layer;
 - a gap layer formed on the lower core layer, with a lower pole layer therebetween;
 - an upper pole layer formed on the gap layer;
 - an upper core layer formed on the upper pole layer; and
 - a Gd-defining layer for defining the depth in the height direction of the joint surface between the gap layer and the upper pole layer, the Gd-defining layer being formed on the lower core layer toward the back in the height direction from a surface facing a recording medium,

wherein the width in the track width direction of the gap layer is smaller than or equal to the width in the track width direction of the upper pole layer when viewed from the surface facing the medium.

Please rewrite Claim 7 as follows:

7. (Amended) A method for making a thin-film magnetic head comprising:
- a step of forming a Gd-defining layer on a lower core layer so as to recede from a surface facing a medium in the height direction by a gap depth;
 - a step of forming a pole section comprising a gap layer formed on the lower core layer, with a lower pole layer therebetween, and an upper pole layer formed on the gap layer; and
 - a step of etching for performing dry etching on both sides of the pole section when viewed from the surface facing the medium,
- wherein, in the step of forming the Gd-defining layer, each extending section of the Gd-defining layer extending from either side of the pole section is set so as to have a predetermined width.

Please cancel Claim 13.

Please add new Claim 16 as follows:

16. (New) A thin-film magnetic head comprising:
- a lower core layer;
 - a gap layer formed on the lower core layer;
 - an upper pole layer formed on the gap layer;
 - an upper core layer formed on the upper pole layer; and
 - a Gd-defining layer for defining the depth in the height direction of the joint surface between the gap layer and the upper pole layer, the Gd-defining layer being formed on the lower core layer toward the back in the height direction from a surface facing a recording medium,
- wherein the width in the track width direction of the gap layer is smaller than or equal to the width in the track width direction of the upper pole layer when viewed from the surface facing the medium.

Please add new Claim 17 as follows:

17. (New) A thin-film magnetic head according to Claim 16, wherein the minimum width in the track width direction of the gap layer is $0.4\ \mu\text{m}$ or less when viewed from the surface facing the medium.

Please add new Claim 18 as follows:

18. (New) A method for making a thin-film magnetic head comprising:
a step of forming a Gd-defining layer on a lower core layer so as to recede from a surface facing a medium in the height direction by a gap depth;
a step of forming a pole section comprising a gap layer formed on the lower core layer, and an upper pole layer formed on the gap layer; and
a step of etching for performing dry etching on both sides of the pole section when viewed from the surface facing the medium,
wherein, in the step of forming the Gd-defining layer, each extending section of the Gd-defining layer extending from either side of the pole section is set so as to have a predetermined width.

Please add new Claim 19 as follows:

19. (New) A method for making a thin-film magnetic head according to Claim 18, wherein the width of each extending section of the Gd-defining layer is set in the range of 0 to $4\ \mu\text{m}$.

Please add new Claim 20 as follows:

20. (New) A method for making a thin-film magnetic head according to Claim 18, wherein the width of each extending section of the Gd-defining layer is set in the range of 1 to $4\ \mu\text{m}$.

Please add new Claim 21 as follows:

21. (New) A method for making a thin-film magnetic head according to Claim 18, further comprising, after the step of forming the pole section, a step of adjusting the width of each extending section of the Gd-defining layer to a predetermined length.

Please add new Claim 22 as follows:

22. (New) A method for making a thin-film magnetic head according to Claim 21, wherein, in the step of adjusting the width of each extending section of the Gd-defining layer, the width of each extending section is adjusted to the predetermined length by one of reactive ion etching and O₂ ashing.

Please add new Claim 23 as follows:

23. (New) A method for making a thin-film magnetic head according to Claim 18, wherein, in the step of forming the pole section, the gap layer and the upper pole layer are deposited in that order.

Please add new Claim 24 as follows:

24. (New) A method for making a thin-film magnetic head according to Claim 18, wherein, in the etching step, the ion irradiation angle is set at 45° to 75° with respect to the direction perpendicular to the lower core layer.

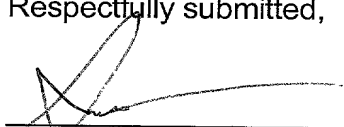
Please add new Claim 25 as follows:

25. (New) A method for making a thin-film magnetic head according to Claim 24, wherein, in the etching step, the ion irradiation angle is set at 55° to 70° with respect to the direction perpendicular to the lower core layer.

REMARKS

Applicants have rewritten portions of Claims 1 and 7. The changes from the previous version to the rewritten version are shown in attached Appendix A, with strikethrough for deleted matter and underlines for added matter.

Respectfully submitted,



Gustavo Siller, Jr.
Registration No. 32,305
Attorney for Applicants

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

APPENDIX A
Attorney Docket No. 9281-4258
Thin-Film Magnetic Head With Narrowed Track Width and Method for
Making Same
Kiyoshi Sato et al.

In the Claims

Please amend Claim 1 as follows:

1. (Amended) A thin-film magnetic head comprising:

a lower core layer;

a gap layer formed on the lower core layer, ~~optionally~~ with a lower pole layer therebetween;

an upper pole layer formed on the gap layer;

an upper core layer formed on the upper pole layer; and

a Gd-defining layer for defining the depth in the height direction of the joint surface between the gap layer and the upper pole layer, the Gd-defining layer being formed on the lower core layer toward the back in the height direction from a surface facing a recording medium,

wherein the width in the track width direction of the gap layer is smaller than or equal to the width in the track width direction of the upper pole layer when viewed from the surface facing the medium.

Please amend Claim 7 as follows:

7. (Amended) A method for making a thin-film magnetic head comprising:

a step of forming a Gd-defining layer on a lower core layer so as to recede from a surface facing a medium in the height direction by a gap depth;

a step of forming a pole section comprising a gap layer formed on the lower core layer, ~~optionally~~ with a lower pole layer therebetween, and an upper pole layer formed on the gap layer; and

a step of etching for performing dry etching on both sides of the pole section when viewed from the surface facing the medium,

wherein, in the step of forming the Gd-defining layer, each extending section of the Gd-defining layer extending from either side of the pole section is set so as to have a predetermined width.